

CLAIMS

Sub B1
1. A method for the simultaneous removal of a plurality of hairs from a skin region, each hair being in a follicle extending into the skin from a skin surface, the method comprising the steps of:
(a) placing an applicator in contact with the skin surface in said skin region; and
(b) applying optical radiation of a selected wavelength and of a selected fluence through said applicator to said skin region, said applying step lasting for a predetermined time interval.

2. A method as claimed in claim 1 including the step of (c) utilizing said applicator to cool the skin surface in said skin region to a selected depth.

3. A method as claimed in claim 1 wherein the skin has an epidermis layer which is the layer of the skin closest to said skin surface, and wherein said selected depth is substantially the depth of said epidermis layer.

4. A method as claimed in claim 1 wherein step (c) includes the step of (d) cooling at least the surface of said applicator in contact with said skin surface both during step (b) and prior to the performance thereof.

5. A method as claimed in claim 1 wherein step (d) is performed by passing a cooling fluid through said applicator.

6. A method as claimed in claim 1 wherein step (b) is not performed until the skin surface in said skin region has been cooled to substantially said selected depth.

7. A method as claimed in claim 2 wherein step (c) is performed during step (b), and wherein said selected fluence and said predetermined time interval are selected such that there is at most minimal heating of skin in said skin region to said selected depth, while causing sufficient heating of at least one of hairs and follicles below said selected depth to at least damage said hairs and follicles without causing significant damage to tissue surrounding said follicles.

^{b.}
B ^{8.} A method as claimed in claim ¹ ~~7~~ wherein said selected fluence and said predetermined time interval are such as to result in the substantial destruction of said follicles.

^{7.}
B ^{9.} A method as claimed in claim ¹ ~~7~~ wherein said selected time interval is 2 to 100 ms.

⁵
Sub ^{10.}
B ~~32~~ A method as claimed in claim 1 wherein step (b) includes the step performed by the applicator of converging the optical radiation applied to said skin region.

¹⁰
11. A method as claimed in claim 1 wherein during steps (a) and (b) pressure is applied to the applicator so as to cause the applicator to deform the skin region thereunder.

^{13.}
~~12.~~ A method as claimed in claim ¹² ~~11~~ wherein the applicator has a convex surface in contact with the skin surface.

Sub ^{13.}
B ~~3~~ A method as claimed in claim 1 wherein step (a) includes the step of forming a fold of the skin in said skin region, and wherein, during step (b), optical radiation is applied to two substantially opposite sides of said fold.

^{16.}
²⁰ ~~14.~~ A method as claimed in claim ¹⁵ ~~13~~ wherein the applicator has a slot formed in the surface thereof in contact with the skin surface, wherein during step (a) at least a portion of the skin region is drawn up into said slot, and wherein during step (b) optical radiation is applied to the skin region from at least two opposite sides of said slot.

Sub ^{15.}
B ~~4~~ A method as claimed in claim 1 wherein step (a) includes the step of (e) providing a substantial refractive index match between the applicator and the skin surface in said skin region.

^{18.}
^{16.} A method as claimed in claim ¹⁷ ~~15~~ wherein step (e) includes the step of providing a layer of a refractive index matching substance between the applicator and the skin surface in said skin region.

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8.
17. A method as claimed in claim 1 including the step performed before step (a) of shaving the hairs in said skin region.

9.
18. A method as claimed in claim 1 including the step performed before step (a) of epilating the hairs in said skin region.

10.
19. A method as claimed in claim 18 including the step performed after the epilating step but before step (a) of filling the follicles from which the hairs have been epilating with a substance which preferentially absorbs optical radiation at said selected wavelength.

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Sub B5 > 20. A method for the simultaneous removal of a plurality of hairs from a skin region, each hair being in a follicle extending into the skin from a skin surface, the method comprising the steps of:

(a) applying optical radiation of a selected wavelength and of a selected fluence to said skin region, said applying step lasting for a predetermined time interval; and

15 (b) cooling the skin surface in said skin region to a selected depth during at least one of step (a) and prior step (a);

whereby at least one of the hairs and follicles may be heated and damaged without causing significant damage to the skin surface in said skin region up to said selected depth.

20 21. A method as claimed in claim 20 wherein step (b) is also performed before the performance of step (a) to precool the skin surface in said skin region to substantially said selected depth.

22. A method as claimed in claim 20 wherein step (b) is performed during step (a), and wherein said selected fluence and said predetermined time interval are selected such that there is at most
25 minimal heating of skin in said skin region to said selected depth, while causing sufficient heating of at least one of hairs and follicles below said selected depth to at least damage said hairs and follicles without causing significant damage to tissue surrounding said follicles.

Sub B6 > 23. An applicator suitable for use in practicing the method of claim 1 comprising:

an inlet through which optical radiation is applied to the applicator;
a surface shaped to contact the skin surface in said skin region;
an optical path from said inlet to said surface which path is substantially transparent to
optical radiation at said selected wavelength;
5 an element in said optical path for converging the optical radiation as it leaves the applicator
through said surface; and
means for cooling said surface to a temperature below that of the skin region.

²²
24. An applicator as claimed in claim ²¹~~23~~ wherein at least said surface is formed of a material
10 having a refractive index which substantially matches, but which is not less than, the refractive index
of the skin surface in said skin region.

²³
25. An applicator as claimed in claim ²¹~~23~~ wherein said element is a lens.

²⁴
15 26. An applicator as claimed in claim ²¹~~23~~ wherein said means for cooling is a channel near said
surface through which cooling water is passed.

27. An applicator as claimed in claim ~~23~~ wherein said surface has a convex shape.

²⁰
B7 28. An applicator as claimed in claim 23 wherein said surface has a slot formed therein, wherein
said optical path leads to at least two opposite sides of said slot, and including means for drawing at
least a portion of said skin region into said slot.

²⁶
B 29. An applicator as claimed in claim ²⁵~~28~~ wherein said means for ^{positioning}~~drawing~~ includes means for
25 applying vacuum to said slot.

²⁸
B8 30. Apparatus for the simultaneous removal of a plurality of hairs from a skin region, each hair
being in a follicle extending into the skin from a skin surface, the apparatus comprising:
an applicator which is adapted to be in contact with the skin surface in said skin region;

a source of optical radiation of a selected wavelength, selected fluence and selected duration;
and

means for applying the optical radiation from said source to said applicator, the optical radiation being passed through the applicator to said skin region.

31. Apparatus as claimed in claim 30 wherein said applicator has a surface in contact with the skin surface, and including means for cooling said surface of the applicator below that of the skin region.

32. Apparatus as claimed in claim ³¹ wherein said means for cooling ^{includes} is a channel near said surface through which cooling water is passed.

33. Apparatus as claimed in claim ³¹ wherein said source of optical radiation is a laser, and wherein said selected duration is 2 to 100 ms.

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